

Appl. No. 10/676,961
Amdt. Dated February 27, 2006
Reply to Office action of December 29, 2005

REMARKS/ARGUMENTS

Claims 1-32 are pending in the present application.

This Amendment is in response to the Office Action mailed December 29, 2005. In the Office Action, the Examiner rejected claims 2, 12, and 31 under 35 U.S.C. §112; claims 11-13, and 17-20 under 35 U.S.C. §102(e); and claims 1, 2, 6-13, 17-20, 31 and 32 under 35 U.S.C. §103(a). Applicants have amended claims 1, 11, and 31. Reconsideration in light of the amendments and remarks made herein is respectfully requested.

Restriction Requirements

In the Office Action, the Examiner indicates that claims 3-5, 14-16, and 21-30 are withdrawn from consideration. However, the Examiner did not provide a response to the response previously filed regarding claims 3 and 14. Applicants, therefore, respectfully request the Examiner to reconsider the previously filed response.

In the Final Office Action dated May 31, 2005, the Examiner contends that since Applicants clearly state that Figures 2B and 3 are different embodiments, they must correspond to different species. Applicants respectfully disagree. As explained in the previous response, the embodiment in Figure 2B has the offset distance d_2 equal to zero. The Examiner has incorrectly equated "embodiment" to "species". Applicants used the term "embodiment" in the remark section to show a variation of the design, not a "species".

Claims to be restricted to different species must be mutually exclusive. The general test as to when claims are restricted, respectively, to different species is the fact that one claim recites limitations which under the disclosure are found in a first species but not in a second, while a second claim recites limitations disclosed only for the second species and not the first. MPEP 806.04(f). Here, no such exclusive mutuality exists between the groups of claims 1, 2, 6-13, 17-20, and 31-32, and claims 3-5, and 14-16. Apparently, the Examiner contends that arrangements in one dimension and two dimensions are mutually exclusive. However, a one-dimensional arrangement is merely a special case of a two-dimensional arrangement.

The test for exclusive mutuality provided by MPEP 806.04(f) fails when applied to these two groups.

For example, claim 13 recites:

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"The method of claim 11 wherein stacking comprises stacking the plurality of dies in a first stair-case configuration in a first dimension."

Claim 14 recites:

"The method of claim 13 wherein stacking further comprises stacking the plurality of dies in a second stair-case configuration in a second dimension."

First, claim 14 is dependent on claim 13. Second, claim 13 recites a feature that stacking in the first dimension, and claim 14 further limits the feature to a second dimension. Since claim 14 depends on claim 13 and further limits the stacking feature, claim 14 does not recite "limitations disclosed only for the second species and not the first". Therefore, claims 13 and 14 are not mutually exclusive according to the test provided by MPEP 806.04(f).

Similarly, claims 2 and 3 are not mutually exclusive. The feature "attaching lower conductors to lower bond pads of the lower die at the lower first edges" is recited in both claims 2 and claim 3. (Note that the words "first" and "second" in claim 3 should have been changed to "upper" and "lower".) Since the limitations are recited in both claims and not "disclosed only for the second species and not the first," they are not mutually exclusive using the test provided by MPEP 806.04(f).

Accordingly, Applicants believe that all figures belong to the same generic species and the restriction requirement is respectfully traversed.

Rejection Under 35 U.S.C. § 112

In the Office Action, the Examiner rejected claims 2, 12, and 31 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention.

Specifically, the Examiner states that it is unclear what applicant regards as "the upper and lower conductors are separated by a conductor distance" in claims 2 and 31, and "the conductors are separated by a conductor distance" in claim 12 (Office Action, page 3). The Examiner contends that the claims and the specification do not provide a standard for ascertaining the requisite degree of the terms, neither "sufficiently large" nor "conductor distance". The Examiner further states that it is not clear how much distance is enough distance to avoid touching or crossing each other. Applicants respectfully disagree.

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Applicants re-iterate the arguments presented in the previously file response.

Applicants respectfully direct the Examiner's attention to the Specification, paragraphs [0021], [0028] and [0032]. The term "conductor distance" refers to a distance to separate the conductors, such as to avoid touching or crossing each other.

Not every claim must be expressed in terms of specific numerical values; rather, the degree of precision with which the claims must be stated to meet the definiteness requirement "is a function of the nature of the subject matter." Miles Labs., 997 F.2d at 875. Thus, "the amount of detail required to be included in claims depends on the particular invention and prior art, and is not to be viewed in the abstract ...," but in conjunction with the specifications of the patent. Shatterproof Glass, 758 F.2d at 624. Accordingly, "that some claim language may not be precise ... does not automatically render a claim invalid. When a word of degree is used the district court must determine whether the patent's specification provides some standard for measuring that degree," such that a person of ordinary skill in the art would understand what is claimed. Seattle Box Co. v. Industrial Crating & Packing, Inc., 731 F.2d 818, 826 (Fed. Cir. 1984).

Here, the term "conductor distance" indicates the distance selected so that the conductors connecting the bond pads on the dies to the bond pads on the substrate are separated to avoid touching or crossing each other. See, for example, Specification, paragraphs [0021], [0028], and [0032]. One of ordinary skill in the art of integrated circuit packaging and assembly would know what is meant by a distance to separate the conductors.

Therefore, Applicants respectfully request the rejection under 35 U.S.C. §112 be withdrawn.

Rejection Under 35 U.S.C. § 102

In the Office Action, the Examiner rejected claims 11-13, and 17-20 under 35 U.S.C. §102(e) as being anticipated by U.S. Patent No. 6,476,474 issued to Hung ("Hung"). Applicants respectfully traverse the rejection and contend that the Examiner has not met the burden of establishing a prima facie case of anticipation.

Applicants reiterate the arguments set forth in the previously filed Response to the Office Action.

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Hung discloses a dual-die package structure and method for fabricating the same. The attachment of the second die over the first die constitutes a face-to-face stacked dual die construction (Hung, col. 4, lines 8-9).

Hung does not disclose, either expressly or inherently, (1) stacking a plurality of dies having at least three dies on top of one another in a staggered configuration such that an upper die top surface in a pair of adjacent dies faces downward or upward and is displaced by a first distance with respect to a lower die in the pair; (2) attaching the adjacent dies by an adhesive layer between the adjacent dies; (3) the upper conductor and the lower conductor being separated by a conductor distance; and (4) a redistribution layer.

Hung merely discloses a dual-die packaging involving exactly two dies facing each other. Since there are only two dies, there cannot be a staggered arrangement as recited in claim 11. In the Office Action, the Examiner contends that Applicants claim only two dies and the term "staggered arrangement" in two dies is nothing more than an offset arrangement of dies (Office Action, page 8). Applicants respectfully disagree with this interpretation. However, to provide further specificity to the claim language, claim 11 has been amended.

In addition, Hung does not disclose a redistribution layer as recited in claim 17. The Examiner states that Hung discloses depositing a redistribution layer which is a layer that contains the bond pads 210 and provides electrical connections between the bond pads 210 and internal elements inside the upper die 200 (Office Action, page 9, third full paragraph). However, Hung merely discloses that the die is formed with a lined array of bond pads on one edge (Hung, col. 3, lines 43-47). A lined array of bond pads is not the same as a redistribution layer.

To anticipate a claim, the reference must teach every element of the claim. "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." Vergegaal Bros. v. Union Oil Co. of California, 814 F.2d 628, 631, 2 USPQ 2d 1051, 1053 (Fed. Cir. 1987). "The identical invention must be shown in as complete detail as is contained in the...claim." Richardson v. Suzuki Motor Co., 868 F.2d 1226, 1236, 9 USPQ 2d 1913, 1920 (Fed. Cir. 1989). Since the Examiner failed to show that Hung teaches or discloses any one of the above elements, the rejection under 35 U.S.C. §102 is improper.

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Therefore, Applicants believe that independent claim 11 and its respective dependent claims are distinguishable over the cited prior art references. Accordingly, Applicants respectfully request the rejection under 35 U.S.C. §102(c) be withdrawn.

Rejection Under 35 U.S.C. § 103

In the Office Action, the Examiner rejected claims 1, 2, 6-13, 17-20, 31, and 32 under 35 U.S.C. §103(a) as being unpatentable over ("Hung") in view of U.S. Patent No. 5,998,864 issued to Khandros et al. ("Khandros"). Applicants respectfully traverse the rejection and contend that the Examiner has not met the burden of establishing a *prima facie* case of obviousness.

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. *MPEP §2143, p. 2100-129 (8th Ed., Rev. 2, May 2004)*. Applicants respectfully contend that there is no suggestion or motivation to combine their teachings, and thus no *prima facie* case of obviousness has been established.

Hung discloses a dual-die package structure and method for fabricating the same as discussed above.

Khandros discloses a stacking semiconductor devices particularly memory chips. Each semiconductor device has a front surface and a back surface and the front surface of the devices 408, 406, and 404 are adjacent to the back surfaces of the semiconductor devices 406, 404, and 402, respectively (Khandros, col. 6, lines 44-49).

Hung and Khandros, taken alone or in any combination, do not disclose, suggest, or render obvious, at least one of (1) stacking an upper die having upper top and bottom surfaces and upper first, second, third, and fourth edges on top of a lower die having a lower top surface and lower first, second, third, and fourth edges such that the upper first edge is displaced from the lower first edge by a first distance, the upper first and third edges being opposite to each other, the lower first and third edges being opposite to each other, (2) the upper bottom surface facing toward the lower top surface such that bond pads on the upper die facing downward while

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bond pads on the lower die facing upward; (3) attaching the upper die to the lower die with an adhesive layer between the upper and lower dies; and (4) attaching the upper die to a third die such that the lower die, the upper die, and the third die are stacked in a stair-case configuration, as recited in claims 1 and 31; and (5) stacking a plurality of dies having at least three dies on top of one another in a staggered configuration such that an upper die top surface in a pair of adjacent dies faces downward or upward and is displaced by a first distance with respect to a lower die in the pair; and (6) attaching the adjacent dies by an adhesive layer between the adjacent dies, as recited in claim 11.

Hung merely discloses a dual-die packaging involving exactly two dies facing each other. Since there are only two dies, there cannot be a staggered arrangement as recited in claims 1, 11, and 31.

In addition, Hung does not disclose a redistribution layer as recited in claims 7 and 17. The Examiner states that Hung discloses depositing a redistribution layer which is a layer that contains the bond pads 210 and provides electrical connections between the bond pads 210 and internal elements inside the upper die 200 (Office Action, page 9, third full paragraph). However, Hung merely discloses that the die is formed with a lined array of bond pads on one edge (Hung, col. 3, lines 43-47). A lined array of bond pads is not the same as a redistribution layer.

Khandros merely discloses the front surface of the devices 408, 406, and 404 face the back surfaces of the semiconductor devices 406, 404, and 402, respectively (Khandros, col. 6, lines 44-49). Therefore, all semiconductor devices face in the same direction so that all the bond pads 412, 414, 416, and 418 are disposed along a common edge of the semiconductor devices (Khandros, col. 6, lines 51-54). In contrast, the claimed invention provides for the upper bottom surface facing toward the lower top surface such that bond pads on the upper die facing downward while bond pads on the lower die facing upward. To clarify this aspect of the invention, claims 1 and 31 have been amended.

There is no motivation to combine Hung and Khandros because neither of them addresses the problem of spacer-less die stacking. There is no teaching or suggestion that a staggered arrangement is present. Hung, read as a whole, does not suggest the desirability of staggering the dies. For the above reasons, the rejection under 35 U.S.C. §103(a) is improperly made.

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When applying 35 U.S.C. 103, the following tenets of patent law must be adhered to: (A) The claimed invention must be considered as a whole; (B) The references must be considered as a whole and must suggest the desirability and thus the obviousness of making the combination; (C) The references must be viewed without the benefit of impermissible hindsight vision afforded by the claimed invention; and (D) Reasonable expectation of success is the standard with which obviousness is determined. Hodosh v. Block Drug Co., Inc., 786 F.2d 1136, 1143 n.5, 229 USPQ 182, 187 n.5 (Fed. Cir. 1986). "When determining the patentability of a claimed invention which combined two known elements, 'the question is whether there is something in the prior art as a whole suggest the desirability, and thus the obviousness, of making the combination.'" In re Beattie, Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick Co., 730 F.2d 1452, 1462, 221 USPQ (BNA) 481, 488 (Fed. Cir. 1984). To defeat patentability based on obviousness, the suggestion to make the new product having the claimed characteristics must come from the prior art, not from the hindsight knowledge of the invention. Interconnect Planning Corp. v. Feil, 744 F.2d 1132, 1143, 227 USPQ (BNA) 543, 551 (Fed. Cir. 1985). To prevent the use of hindsight based on the invention to defeat patentability of the invention, this court requires the Examiner to show a motivation to combine the references that create the case of obviousness. In other words, the Examiner must show reasons that a skilled artisan, confronted with the same problems as the inventor and with no knowledge of the claimed invention, would select the prior elements from the cited prior references for combination in the manner claimed. In re Rouffet, 149 F.3d 1350 (Fed. Cir. 1996), 47 USPQ 2d (BNA) 1453. "To support the conclusion that the claimed invention is directed to obvious subject matter, either the references must expressly or implicitly suggest the claimed invention or the Examiner must present a convincing line of reasoning as to why the artisan would have found the claimed invention to have been obvious in light of the teachings of the references." Ex parte Clapp, 227 USPQ 972, 973. (Bd.Pat.App.&Inter. 1985). The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. In re Mills, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990). Furthermore, although a prior art device "may be capable of being modified to run the way the apparatus is claimed, there must be a suggestion or motivation in the reference to do so." In re

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Mills 916 F.2d at 682, 16 USPQ2d at 1432; In re Fitch, 972 F.2d 1260, 23 USPQ2d 1780 (Fed. Cir. 1992).

In the present invention, the cited references do not expressly or implicitly suggest a staggered arrangement. In addition, the Examiner failed to present a convincing line of reasoning as to why a combination of Hung and Khandros is an obvious application of spacer-less die stacking.

Therefore, Applicants believe that independent claims 1, 11, and 31 and their respective dependent claims are distinguishable over the cited prior art references. Accordingly, Applicants respectfully request the rejections under 35 U.S.C. §103(a) be withdrawn.

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Conclusion

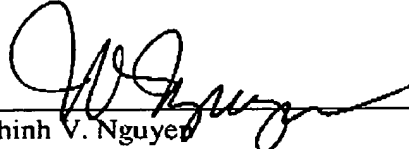
Applicant respectfully requests that a timely Notice of Allowance be issued in this case.

Respectfully submitted,

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